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ABSTRACT

The report discusses students' general educational skills development and outcomes assessment at College of DuPage (COD)(Illinois). Since one goal of general education assessment was to provide a comparison to other institutions, selection from among three national standardized tests of general skills was undertaken rather than the development of a local college-specific test of competence. College Assessment of Academic Proficiency (CAAP) provided six area-tests that could be aggregated as valid and reliable institution level measurements. The aims of general education are to enable students to understand and appreciate their culture, understand and appreciate their environment, and develop a system of personal values based on accepted ethics that lead to civic and social responsibility. The three skills areas where direct measurements of student proficiency were obtained from the ACT-CAAP testing over the past two years are as follows: skills in analysis, skills in communications, and skills in quantification-mathematics. Assessment of skills development in analysis may be inferred from two of the subject area tests in the CAAP battery: critical thinking and scientific reasoning. Results from the Critical Thinking test indicate that entering COD freshmen score significantly higher than the national average for freshmen at two-year public colleges as reported by ACT. (Contains tables and figures.) (JA)

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General Education Skills Development

An Analysis of Students' General Educational Skills Development at College of DuPage Utilizing Four Rounds of CAAP Scores – Fall 1998, 1999 to Spring 1999, 2000

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Chapter

1 Assessment of General Education

Background and history

Institutional level assessment of general education at College of DuPage (COD), or any community college, is a challenging task. Consideration of the challenges can be divided into at least two distinct sets of issues. One set of issues focuses on defining general education outcomes and then operationaiizing that definition with appropriate instrumentation. A second set of issues focuses on implementing the measures defined in the first focus. Responding to these challenges, the General Education sub-committee of the Student Outcome Assessment Committee and the General Education Enduring Purposes Team memberships have cooperated during the past three years to complete two rounds of representative testing of general education and to provide feedback to all stake holders concerning their findings.

Challenges to assessment at College of DuPage

As with any inquiry, the first steps involve identifying what one intends to study. Within the general assessment framework, student learning needs to be examined through multiple measures at multiple levels from classroom through institutional levels. Activities at classroom and disciplinary levels have been initiated and are described in other documents of the Student Outcome Assessment Committee. When considering general education assessment, two limits need to be addressed: what are the skills, attitudes, and characteristics being assessed and who is eligible within the population as representative of the cohort being assessed?

Answering the first question, **"What is general education?"** is a challenge faced at any institution attempting general education assessment. Discussion and debate as to a meaning for "general education" can occupy years and careers. A choice made by members of the Student Outcome Assessment Committee was to operationalize some inquiry, accepting that future discussions and alternative measures might result in other assessment formats. Thus, these rounds of assessment of general education at College of DuPage utilized the following premises.

- General Education is learning which occurs as a result of multiple experiences and courses throughout a student's educational activities, not a specific learning resulting from a sequence of identified courses.
- General Education is defined as those ideals expressed in the following statement from the college catalog.

> The aims of general education are to enable students to understand and appreciate their culture and environment; to develop a system of personal values based on accepted ethics that lead to civic and social responsibility; and to attain the skills in analysis, communication, quantification, and synthesis necessary for further growth as a lifespan-learner and productive member of society.

Consideration of this published statement results in identification of seven competencies that may be taken as an operational definition of general education at College of DuPage.

1) An aim of general education is to enable students to **understand and appreciate their culture**

2) An aim of general education is to enable students to **understand and appreciate their environment**

3) An aim of general education is to **develop a system of personal values based on accepted ethics that lead to civic and social responsibility**

4) An aim of general education is to attain the skills in **analysis** necessary for further growth as a lifespan-learner and productive member of society. *

5) An aim of general education is to attain the skills in **communication** necessary for further growth as a lifespan-learner and productive member of society. *

6) An aim of general education is to attain the skills in **quantification** necessary for further growth as a lifespan-learner and productive member of society. *

7) An aim of general education is to attain the skills in **synthesis** necessary for further growth as a lifespan-learner and productive member of society.

It should be evident that there is no single procedure adequate to assess all of these outcomes. However, there is a core of general education competencies that can be identified as academic skills and which can be assessed using nationally standardized tests. These skills are analysis, communication, and quantification, and they are marked with *'s above. We will return to operationalizing this definition of general education later (see page 3). Continuing with defining the project, one moves to consider identification of the population.

At many colleges and universities one can clearly identify students as admitted to the college or program, graduating or finishing a program, etc. Some of these same criteria are used at College of DuPage when students in programs are clearly admitted and completed. Such is not, however, the situation with general education. Students enroll for a few courses, come to complete degrees, or come to earn enough credit to transfer. Students move on, transfer, stop-out, and are satisfied based on their own criteria. Thus, the college has no controls that would allow us to identify and encourage exit testing or assessment.

Along with this lack of clearly identified qualification, past efforts by the college to recruit students' participation in testing have failed despite rewards including free course work and bookstore coupons. (It may be that the idea of **testing** is the issue, given students' willingness to participate in focus groups when offered pizza and pop.)

Responses to the assessment challenges

Designing a response to these challenges resulted in applying a process first developed by the Value Added Committee in 1986. It was that committee which first designed a random section-based sampling used to field tested the six CAAP area-tests for ACT.

Why the CAAP tests?

Since one goal of general education assessment was to provide a comparison to other institutions, selection from among three national standardized tests of general skills was undertaken rather than the development of a local college-specific test of competence. Members of the Student Outcome Assessment Committee chose the College Assessment of Academic Proficiency (CAAP) based on four observations.

- CAAP provided national averages for both 2-year and 4-year public colleges for both freshmen and sophomore levels.
- CAAP provided six area-tests that could be aggregated as valid and reliable institution level measurements. This feature contrasted with more global single tests from which subject area scores were derived.
- Each of these area tests could be administered in 50 minutes (according to the test protocol documents).
- CAAP was judged least dependent on specific content ideas and, therefore, was judged most likely to evaluate general learning when students were not mandated into specific core courses.

The six area-tests lined up well with a core of general education skills. The general education outcome of Analysis aligns with the CAAP area-tests of **Critical Thinking** and **Science Reasoning**. The general education outcome of Communication skills can be defined as including four skills – reading, writing, listening, and speaking. Two of these skills align with three CAAP area-tests. Writing can be assessed with the **Writing Skills** (a multiple choice test) and **Essay** Writing (a demonstrated essay) area-tests. The college level **Reading** area-test examines context reading in both the arts and social sciences. Assessment of Quantification aligns with the **Mathematics** area-test that covers material from algebra through calculus.

Assessment of the outcomes of understanding, appreciation and development of values in the areas of culture, environment and ethics, the first three outcomes listed in the general education statement, are not as easily implemented. Since the sampling method provides a representative sampling of students, three of the institutional questions on the CAAP response form were designed to begin assessment of students' perceptions in these areas. With the choice of an evaluation tool in place, the next issue was student-subject selection.

Sampling model

Because we concluded that mandatory college-wide testing was not feasible and voluntary testing efforts of the past resulted in high recruiting costs for low participation, a sampling model utilizing a stratified, random sampling of class-sections was developed.

The random selection of class-sections assured testing a broad range of students with relatively low rates of non-participation. A high rate of participation is an important step in developing a representative sample. But, as may be evident and perhaps already distracting to the reader, such testing will result in the assessment of a range of students, only some of whom may match the ideal characteristics of entering freshmen or completing, graduating or transferring sophomores. Utilizing this full range of students' data is an important issue we considered when designing the analysis of these data. The design of this all-encompassing analysis will be discussed later (see page 27). For now, let's finish the explanation of the sampling mode.

Assessment tests are conducted twice a year – fall and spring. In each round of assessment we attempted to gather at least 100 tests in each subject area. Thus, approximately 700 tests are administered in each testing cycle. The model called for random sampling from all possible sections of introductory classes (100 level single classes and sequences classes ending in 1 during the fall). During the spring the sampling was drawn from 200 level courses and end of sequences courses.

After initial identification of class-sections, the faculty assigned to each section are contacted with a request for their cooperation. Sections are drawn from throughout the college and include both full-time and part-time faculty. Faculty cooperation has been very high with only an occasional refusal. Testing is scheduled for a specific day and time, although it is suggested that students not be told the specific date. To encourage cooperation, faculty are provided a handout explaining CAAP assessment, which can be distributed to students.

When CAAP tests are administered in the selected sections, each of the six subject areas is rotationally assigned to some students. Thus, in any one section some students complete each of the subject area-tests.

Results from the first cycle of testing were analyzed and conclusions reported in the fall of 1999.[1] Since the sampling produced a reasonable number of cases and the analysis revealed no evidence of sampling bias, a second cycle of testing was completed in the fall of 1999 and spring of 2000. The following report utilizes both of these cohorts.[2]

Analysis model – Questions being addressed

Given the challenges of defining and administering a pre-post test model at COD, the research design accommodates these constraints. If one accepts that a clear pre-post test model cannot be implemented, but that a representative sampling of all students can be drawn using the data collection method described, then several approaches to analysis can be implemented.

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[1] *An Assessment Report on Students' General Education Development at College of DuPage.* October 12, 1999. Student Outcome Assessment Committee, College of DuPage.

[2] In analyses not reported here the 2000 cohort was evaluated with regard to similarities and significant differences compared with the 1999 cohort. None of the differences noted were substantial or significant enough to warrant separate reporting.

Comparing a cross-section of students beginning their studies with another cohort near completion of their studies is a less desirable alternative than the pre-post model.[3] Such a comparison can focus on two questions.

- Are the entering and leaving students similar to national standards for similar students at other colleges and universities?

- Is there an indication that students have changed during their studies at an institution?

In the "Comparison" chapter these types of models are reported starting on page 20. However, it needs to be noted that such comparisons are limited in the number of cases which can be classified as appropriate to the two points used in the analysis. In this round just over six hundred cases out of 2345 cases (26%) are classified as either entering freshman or completing sophomores. For the purpose of comparison a third category was defined to include those students at a mid-point in their studies. These students might be classified as end of freshmen year or beginning of sophomore year. In this report they are labeled as **mid-studies.** The mid-studies classification contains an additional 26% of the cases. However, there are no national norms against which these students can be compared.

In order to make more efficient use of the tests collected, a broader analysis lies in constructing a statistical model that uses cases at all points along the educational development continuum. One approach to doing this lies in modeling general education skills development based on a continuous development over the number and type of courses taken. Such a model can use most of the data collected in that it focuses on more than the initial and final points on the continuum of learning. Such models, although more complex than the two-point analysis, can be very interesting. These models are reported starting on page 27.

Before beginning these considerations, the characteristics of students taking one of the CAAP area-tests during the four rounds are summarized in the following chapter. These examinations focus on developing an understanding of students' characteristics.

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[3] The major limit of a cross-sectional design is that any change among subjects in skills must be more substantial in a cross-sectional design than in a pre-post design in order to attain statistical significance. Thus, as in the case of general education, where change as subtle as one-half of the beginning standard deviation are observed, the power to detect significant change is reduced from that possible in a pre-post model.

Chapter

2 Findings

General student characteristics

As previously reported, the 1999 cohort consisted of 1148 cases. The 2000 cohort contained 1191 cases. In both cohorts a few cases could not be matched to student records in the student tracking system; these cases were removed from the data set. Table 1 reports the numbers of tests in each of the six subject-areas by the testing date. The lower portion of Table 1 includes the breakout of educational level by testing date. Five percent of the freshmen completing a test were not enrolled at the time of the next testing. These stop-outs were not included when reporting entering freshmen scores. Twenty-three percent of the students did not begin their college studies at COD. These cases were aggregated with COD-native students when they earned more than 20 hours at COD and reported having earned fewer than 21 hours at other colleges. Cases with self-reports of earning 0 to 20 quarter-hours credit at other schools were also aggregated with native-COD students in a process described on page 19. This aggregation was judged appropriate, based on examinations and comparisons of native and non-native students in last year's research report, which showed no significant differences between native and non-native students with similar levels of COD course work.

- **Table 1 Sampling distributions and efficiency**

	Fall, 1998	Spring, 1999	Fall, 1999	Spring, 2000	Total
Writing Skills	111	84	87	115	397 17%
Math	95	91	88	114	388 16.6%
Reading	99	95	85	106	385 16.5%
Critical Thinking	98	91	86	116	391 16.7%
Science Reasoning	95	92	86	112	385 16.5%
Essay	108	89	88	108	393 16.8%
Total	606 25.9%	542 23.2%	520 22.2%	671 28.7%	2339

	Fall, 1998	Spring, 1999	Fall, 1999	Spring, 2000	Total
Classified Freshman	164	9	115	–	288 12.3%
Classified mid-Fresh./Soph.					608 26%
Classified Sophomore	41	92	26	131	290 12.4%
Stop-outs					114 4.9%
Did not begin at COD					548 23.4%
Sections Sampled	27	32	29	39	

Table 2 summarizes the age and sex distribution of the sample. Fifty-seven percent of the participants are female and 76% are between the ages of 18 and 24. Ages ranged from 16 to 97 years with an average of 23.9 years old (9.06 years standard deviation) at the time of completing the test.

- **Table 2 Age by sex**

		Gender/Sex		
Age categories		Female	Male	Total
< 18	Count	17	7	24
	% Of Total	.7%	.3%	1.1%
18 - 24	Count	913	809	1722
	% Of Total	40.2%	35.6%	75.9%
25 - 30	Count	115	79	194
	% Of Total	5.1%	3.5%	8.5%
31 - 36	Count	73	29	102
	% Of Total	3.2%	1.3%	4.5%
37 - 42	Count	81	22	103
	% Of Total	3.6%	1.0%	4.5%
43 - 48	Count	52	10	62
	% Of Total	2.3%	.4%	2.7%
49 - 54	Count	26	8	34
	% Of Total	1.1%	.4%	1.5%
> 54	Count	17	12	29
	% Of Total	.8%	.5%	1.3%
Total	Count	1294	976	2270
	% Of Total	57.0%	43.0%	100.0%

Table 3 lists the self-reported ethnic/racial categories of the participants. Seventy-eight percent of the participants classified themselves as "white, Caucasian." The "Asian/Pacific Islander " category was the second largest classification at 9%.

- **Table 3 Ethnic self identification**

	Frequency	Percent	Valid Percent	Cumulative Percent
Black/African - American	49	2.1	2.3	2.3
Amer. Indian/ Alaskan Native	5	.2	.2	2.6
White Caucasian	1653	70.5	78.2	80.7
Mexican-American / Chicano	77	3.3	3.6	84.3
Asian/ Pacific Islander	188	8.0	8.9	93.2
Puerto Rican/ Cuban/ Hispanic	36	1.5	1.7	94.9
Filipino	47	2.0	2.2	97.2
Other	60	2.6	2.8	100.0
Total valid	2115	90.2	100.0	
Prefer not to respond	122	5.2		
System missing	107	4.6		
Total	2344	100.0		

Eight-six percent of the participants identified English as their first language. The 13.6% non-native English speakers in the COD sample are substantially higher than the 3.8% and 2.9% non-native speaks found in the *CAAP User Norms* for freshmen and sophomores in two-year public colleges.

Seventy-three percent of the participants reported full-time enrollment.

Table 4 lists the goals of participants. The leading goal, at 52%, is transfer to another college or university. The observation that this focus is greater than the 33% targeting an Associates Degree provides support for the observation that degree completion is not a valid criterion for evaluation of student outcomes.

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- **Table 4 Most important goal**

	Frequency	Valid Percent	Cumulative Percent
Associates Degree	661	33.1	33.1
Certificate in specific field	97	4.9	38.0
Transfer to college or university	1047	52.4	90.4
Transfer to technical school	20	1.0	91.4
Upgrade current job skills	29	1.5	92.8
Learn a specific skill	40	2.0	94.8
Personal Interest	44	2.2	97.0
Other	59	3.0	100.0
Total	1997	100.0	

Table 5 summarizes the self-reported number of hours per week spent studying outside of class for the respondent's average class. Participants reported a mean average of 4.25 hours and median of 4 hours spent studying per week for their average class (s.d.= 2.7). Among respondents, 9.6% reported spending no study time on their average class. Among entering freshmen, the average study time was 3.47 hours. This increased to 4.02 hours in mid-studies students, and 4.82 among completing sophomores. As a basis for comparison, most courses range from 3 to 5 hours. The plurality of courses is 5-quarter hours. Based on these reports and assumptions, it appears the average student spends about one hour outside of class for each hour in class. This is below the two-hour ratio suggested in both state statutes and general advising. However, it is also above the frequent stereotyped patterns. The relationship of study time to general education skills is examined later in the modeling chapter on page 27.

- **Table 5 Self-reported study hours per course**

Study-hours in average class	Frequency	Percent	Valid Percent	Cumulative Percent
0	189	8.1	9.6	9.6
1	152	6.5	7.7	17.2
2	233	9.9	11.8	29.0
3	264	11.3	13.3	42.3
4	270	11.5	13.6	56.0
5	276	11.8	13.9	69.9
6	168	7.2	8.5	78.4
7	92	3.9	4.6	83.1
8	134	5.7	6.8	89.8
9	201	8.6	10.2	100.0
Total valid	1979	84.5	100.0	
System missing	364	15.5		
Total	2343	100.0		

One time commitment that is frequently characterized as cutting into students' studies is employment. For this examination we included recognition that volunteer activities might be considered similar to employment. This classification is not intended as a judgment of the worth of community services nor a judgment to exclude learning from community service from learning in an educational setting.

Table 6 summarizes the time spent on employment (and volunteer activities) and household tasks. The percent of participants reporting no paid employment or no household work is five to seven percent lower in the combined sample than in the 1999 cohort. The median choice for employment for entering freshmen, mid-studies, and completing sophomores was the category 16 to 30 hours per week. The median choice for household work for freshmen, mid-studies, and completing sophomores was the category 1 to 15 hours.

- **Table 6 Time allocation - employment, household**

	Employment			Household		
	Frequency	Percent	Cumulative Percent	Frequency	Percent	Cumulative Percent
No paid employment (no volunteer)	335	16.9	13.1	258	13.1	16.9
1 -15 hours per week	278	14.0	74.5	1214	61.5	30.9
16 - 30	733	36.9	88.4	273	13.8	67.8
31 - 45	479	24.1	92.9	90	4.6	91.9
Over 45 hours per week	161	8.1	100.0	140	7.1	100.0
Total	1986	100.0		1975	100.0	

Observations based on two cohorts

Although comparison of the two test cohorts, 1999 with 2000, is not an issue being examined in this analysis, some observations need to be documented. In each of the cohorts the goal was to obtain at least 100 scores in each subject-area test in each of the testing cycles. Examination of Table 1 Sampling distributions and efficiency on page 7 documents that we came close to this goal. However, it is also important to note that these samples netted about twenty-five freshmen and completing sophomores in each subject-area test per testing year. These small numbers stretched the lower limits of parametric statistical testing. Thus, with the combination of the two years the numbers of cases utilized in the following analyses have approached a moderate level of acceptability.

Examinations and comparison of the two cohorts has also confirmed our expectation that the random stratified sampling of course sections produces an appropriate sample. However, there are non-biased but significant differences in some of the characteristics of these two rounds. The combining of them into one pool for analysis has produced a sample that, as theory would predict, smoothes out the specific test cycle characteristics. Thus, the combined pool of participants has provided a basis for the following analysis that we conclude is a strong basis for generalization. The question of whether future

assessment should be limited to data from two years or include three years will need to be addressed next year.

Participation and motivation

One issue of concern in considering student outcome assessment when measured in a low stakes setting, such as the CAAP testing at COD, is the impact of participation, motivation and effort by students. The sampling of class sections used to construct a random sampling and the testing procedure of unannounced testing results in a very high participation rate. One check on this participation rate is a comparison of the number of students enrolled in the sampled course-sections and the number of test takers. We have not formally collected these data, but our estimation based on total numbers tested and totals enrolled is that participation rates are between 70% and 80% of the tenth day enrollment listings. Accepting that the tenth-day enrollments contain some students not actively pursuing studies, we conclude a very high level of participation and congruence between selection and participation. The next issue concerns the effort these subjects put into testing.

Table 7 summarizes the self-report of students' efforts on the CAAP tests. The ACT Essay test form does not include response space for the institutional questions. While we tried to collect student responses on separate pages, collection was not consistent. So none of the responses from students completing the Essay area-test have been included. Among student completing the other five subject-area tests, nineteen percent did not report their effort.

- **Table 7 Self report of effort**

	Frequency	Percent	Valid Percent	Cumulative Percent
Tried my best	661	28.2	43.2	43.2
Gave moderate effort	625	26.7	40.8	84.1
Gave little effort	197	8.4	12.9	96.9
Gave no effort	47	2.0	3.1	100.0
Total valid	1530	65.2	100.0	
No response	438	18.7		
No response - Essay Sub-test	377	16.1		
Total missing	815	34.8		
Total	2345	100.0		

Eighty-four percent of the respondents reported that they either tried their best or gave moderate effort. This effort was consistent between the two rounds of testing. However, analysis of these self-reports indicates that there is also a consistent and significant difference with fall participants reporting less effort than spring participants (Fall = 81% & 83% at "tried my best," and "gave moderate effort." Spring = 86% & 86% in these two categories. X^2=24.5, sig. < .004).

Examinations of these self-reports based on subject-area tests indicated a significant dependence of effort on the subject-area test (X^2=59.16, sig. <.000). Greatest efforts were

reported for critical thinking (90.3%) and writing skills (90%). Math (83%) and reading (80%) were next in effort. The lowest effort level for science reasoning was still a solid effort at 75.8% in these two categories.

On average women (86.9%) reported significantly greater effort (X^2=27.26, sig. <.000) than men (80.1%). Age was also significantly related to effort (X^2=69.03, sig. < .000). The general pattern indicated increased efforts with increasing age. Sixty-five percent of the participants younger than 18 reported in the first two categories compared with 83% in the 18-24 classification. In each of the six-year categories from 25 to 55 the self-reports ranged from 87% to 100%). .

There was no significant difference between the two test-cycle cohorts except the seasonal effect noted above. There was no significant difference in the efforts reported by students speaking English as their first language and those who did not speak English as their first language.

Analysis of the ethnic/race effects of effort indicated that those self-identifying with Black African-American, White Caucasian, and Asian/Pacific Islander reported similar rates of 84%, 85%, and 86% respectively. Rates among the four Hispanic categories varied greatly with some categories containing very few respondents. Rates ranged from Filipino's reporting 90% to the Puerto Rican and Cuban's category reporting 63%. The lowest ranking of effort came from those choosing "other" (77%) and "prefer not to respond" (72%). The "Native American" category contained too few cases to reliably report.

While there is some evidence of "alienation" whether focused on hostility towards schooling or testing, overall the participation and motivation of respondents is considered appropriate and acceptable.

Self-reports on general education development in cultural and environmental appreciation and ethical responsibility

The implementation of CAAP testing was recognized as a starting point for assessing general education skills. It was accepted that the subject-area tests covered only a core of the outcomes targeted in the goal statement. While there may be more authentic measures than self-report, at this time the only indicators available for consideration are self-report responses to three items focused on culture, environment, and ethics. In the 2000 cycle of assessment three institutional-designed questions asked participants about their appreciation of the impact of COD courses on these areas. In each case these judgments can serve as a baseline for future assessment.

The form of these questions was similar.

- Based on your experiences at College of DuPage, how have your courses impacted your **understanding and appreciation of your culture**?
- Based on your experiences at College of DuPage, how have your courses impacted your **understanding and appreciation of the environment**?
- Based on your experiences at College of DuPage, how have your courses helped you **develop personal values based on accepted ethics that lead to civic and social responsibilities**?

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Responses for each of these questions were parallel.

0. I've not completed enough courses to make a judgment.
1. My COD education has had no impact on....
2. My COD education has had little impact on....
3. My COD education has had moderate impact....
4. My COD education has had meaningful impact....
5. My COD education has had very significant impact....

Appreciation of one's culture

Table 8 lists the responses utilizing all of the available cases from the 2000 cohort. Twenty-eight percent of the respondents ranked their COD course experience as having either meaningful or very significant impact on development of their cultural appreciation.

- **Table 8 Courses' impact on cultural appreciation**

	Frequency	Percent	Valid Percent	Cumulative Percent
No impact	173	7.4	25.0	25.0
Little Impact	132	5.6	19.0	44.0
Moderate Impact	195	8.3	28.1	72.2
Meaningful Impact	149	6.4	21.5	93.7
Significant Impact	44	1.9	6.3	100.0
Total valid	693	29.6	100.0	
Not enough to judge	260	11.1		
System missing	1390	59.3		
Total	1651	70.4		
Total	2344	100.0		

As with most general education outcomes, examination of development of values and attitudes over a series of courses is important. Table 9 lists the rankings by educational level. The data appears to support a conclusion that over the two-year period, the trend is an increase in the percent of students who rate their COD courses as having meaningful or very significant impact on their cultural appreciation. This conclusion of the dependence of impact on educational level is supported by a X^2=21.737, sig.=.005. Among completing sophomores, 35% rank their COD courses' impact as meaningful or very significant on development of a cultural appreciation.

- **Table 9 Courses' impact on cultural appreciation by educational level**

		Classified Educational Level			Total
		Entering Freshmen	Mid-studies	Completing Sophomores	
No impact	Count	5	54	18	77
	%	35.7%	30.2%	13.8%	23.8%
Little Impact	Count	5	28	23	56
	%	35.7%	15.6%	17.7%	17.3%
Moderate Impact	Count	1	58	43	102
	%	7.1%	32.4%	33.1%	31.6%
Meaningful Impact	Count	2	32	33	67
	%	14.3%	17.9%	25.4%	20.7%
Significant Impact	Count	1	7	13	21
	%	7.1%	3.9%	10.0%	6.5%
Total	Count	14	179	130	323
	%	100.0%	100.0%	100.0%	100.0%

Appreciation of one's environment

Table 10 lists the rankings from participants of their COD course's impacts on environmental appreciation. Twenty-four percent of the respondents judged their courses as having meaningful or very significant impact on their environmental appreciation.

- **Table 10 Courses' impact on environmental appreciation**

	Frequency	Percent	Valid Percent	Cumulative Percent
No impact	157	6.7	22.2	22.2
Little Impact	159	6.8	22.5	44.6
Moderate Impact	218	9.3	30.8	75.4
Meaningful Impact	132	5.6	18.6	94.1
Significant Impact	42	1.8	5.9	100.0
Total valid	708	30.2	100.0	
Not enough to judge	240	10.2		
System missing	1394	59.5		
Total	2344	100.0		

Table 11 classifies participant's rankings of impact on environmental appreciation by educational level. Indications again support concluding that the courses at COD tend to increase environmental appreciation (X^2=27.169, sig.001). Thirty-seven percent of the

completing sophomores rank their COD courses as having meaningful or very significant impact on their development of environmental appreciation.

- **Table 11 Courses' impact on environmental appreciation by educational level**

		Classified Educational Level			
		Entering Freshmen	Mid-studies	Completing Sophomores	Total
No impact	Count	6	46	13	65
	%	33.3%	25.3%	10.1%	19.8%
Little Impact	Count	2	46	30	78
	%	11.1%	25.3%	23.3%	23.7%
Moderate Impact	Count	4	60	39	103
	%	22.2%	33.0%	30.2%	31.3%
Meaningful Impact	Count	6	24	37	67
	%	33.3%	13.2%	28.7%	20.4%
Significant Impact	Count	0	6	10	16
	%	0%	3.3%	7.8%	4.9%
Total	Count	18	182	129	329
	%	100.0%	100.0%	100.0%	100.0 %

Development of personal values based on accepted ethics that lead to civic and social responsibility

Table 12 summarizes the rankings of participants concerning their evaluation of the impact of their COD courses on development of values based on accepted ethics that lead to civic and social responsibility. In contrast to the previous two questions, only 31% of the respondents ranked the impact as meaningful or very significant.

- **Table 12 Courses' impact on ethical appreciation**

	Frequency	Percent	Valid Percent	Cumulative Percent
No impact	131	5.6	18.5	18.5
Little Impact	128	5.5	18.1	36.6
Moderate Impact	231	9.9	32.7	69.3
Meaningful Impact	162	6.9	22.9	92.2
Significant Impact	55	2.3	7.8	100.0
Total	707	30.2	100.0	
Not enough to judge	236	10.1		
System	1399	59.7		
Total	2344	100.0		

Table 13 summarizes the cross-tabulation of impact and educational level. Once again impact is dependent on educational level indicating increasing impact over the course of students' studies (X^2=23.496, sig.003). Although starting out as the lowest ranking of impact among freshmen, the completing sophomore rankings are highest at 42% at the meaningful or very significant level.

- **Table 13 Courses' impact on ethical appreciation by educational level**

		Classified Educational Level			
		Entering Freshmen	Mid-studies	Completing Sophomores	Total
No impact	Count	8	32	13	53
	%	38.1%	17.7%	10.2%	16.1%
Little Impact	Count	2	30	21	53
	%	9.5%	16.6%	16.5%	16.1%
Moderate Impact	Count	3	71	39	113
	%	14.3%	39.2%	30.7%	34.3%
Meaningful Impact	Count	4	38	37	79
	%	19.0%	21.0%	29.1%	24.0%
Significant Impact	Count	4	10	17	31
	%	19.0%	5.5%	13.4%	9.4%
Total	Count	21	181	127	329
	%	100.0%	100.0%	100.0%	100.0%

Chapter

3 Comparisons

In this chapter we examine two approaches acquisition of general education skills at an institutional level. One approach utilizes comparison of entering freshmen and completing sophomores to national averages for two-year public community college students. This comparison is expanded with the additional listing of four-year public university averages. A second approach utilizes comparison of College of DuPage entering freshmen, mid-studies, and completing sophomores.

These comparisons require classification of cases based on students' course completion. This may appear to be an easy task, but it's not. There are several sources that may be used as a basis for this classification. First, students self-reported on the CAAP answer sheet their educational level as freshmen, sophomore, junior, senior, and other. Students also self-reported the number of credits earned and the number of credits earned at other colleges. The student tracking system (STS) is a second major source of information. Two indicators of educational level were developed from these data. First, the total credit hours earned in college-level courses (=>100) at the end of the quarter during which testing occurred were identified. Second, utilizing transcripts (from the student tracking system) the total number of college-level courses (=>100) successfully completed in each of eight subject-discipline areas and the total number of courses successfully completed were tallied.

The process of classifying educational level involved utilization of all of these measures. One might hope that all of these measures might have general congruence for all of the cases. Unfortunately, some tend not to agree. To resolve conflicts the two measures from STS were considered more reliable than student reports.

Educational level categories for analysis were defined as 1) entering freshmen, 2) mid-studies – mid-freshmen/sophomore, 3) completing sophomore. To operaitonalize this definition, the actual distribution of credits earned at COD and at other colleges was examined. Based on these examinations the following definitions were established.

Entering freshmen (1) earned 20 or fewer quarter hours at the end of the quarter during which they completed the CAAP test. Further, in these comparison entering freshmen were included in analysis only if they self-reported beginning their studies at COD.

Mid-studies (freshmen/sophomores) (2) earned between 41 and 60-quarter hours at the end of the quarter during which they completed the CAAP test. Classification of mid-studies included students who reported earning fewer than 21 quarter-hour credits at other college or universities.[4]

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[4] Including non-native cases reporting few transfer credits was based on a comparison of these students reported in *An Assessment Report on Students' General Education Development at College of DuPage*, October 12, 1999.

Completing sophomores (3) earned between 81 and 110-quarter-hours[5] at the end of the quarter during which they completed the CAAP test. This classification also included students who reported earning fewer than 21 quarter-hour credits at other colleges and universities.

This classification system is effectively applied to native-students (self-reported that their studies began at COD), although even here there are a number of students who self-report a different classification than that identified through the STS. This classification procedure also worked for those cases who reported earning very few credits at other schools but who did not begin their studies at COD. This classification scheme resulted in educational levels 1, 2, and 3 for those meeting the criteria specified above and 1.5, 2.5 for those cases between the three classifications defined.

A greater challenge is classifying reverse transfer students who bring in more than 20 quarter-hours credit. For those cases that were not native students, several classification routines were applied. The self-report of credits earned at other colleges were factored into an estimation of total credits. These projections resulted in educational levels ending in decimal fractions.

Thus in the following analysis, selection of cases with educational levels of 1, 2, or 3 provided clear categories of students meeting specified criteria. This selection was used in all of the comparisons. The cases with decimal educational levels were used in the modeling but not in the comparisons.

COD and national norms

One of the reasons for selecting ACT's *Collegiate Assessment of Academic Proficiency* (CAAP) was to provide a reference norm. The annual publication of standardized norms provides such a reference. In the case of this analysis the *Fall, 1999 CAAP User Norms* are referenced.[6]

Table 14 lists the mean average for each of the three classifications of educational level on each of the six subject-area tests. Also listed are the ACT-CAAP 2-year public college and 4-year public college national averages. As with any comparison of average drawn from samples, one must consider a margin of error before concluding significant differences. Base on t-test comparisons, entering freshmen's average in writing skills is significantly lower than the national 2-year average. Entering freshmen's averages in

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[5] The upper limit defined in classification of educational level was identified during previous research. It was noted at that time that the sampling method included a few "perpetual" students earning credits well beyond the 96 quarter hour credits required for graduation and/ or transfer. Since the focus of this research is on the acquisition of general education skills we judged that the few cases with course credits beyond 110 quarter-hours were outliers and were not representative of the general student population. Thus, these cases were not used in making comparative evaluations.

[6] The *CAAP User Norms: Fall, 1999* are based on the average of the previous three years' test takers who self-identified into the categories described in the published classification categories. Thus, the averages we used were a general summary of students reporting freshmen and sophomore status at 2-year public colleges. In general these averages would tend to describe entering freshmen and completing sophomores, but it should be noted that the averages are not criterion based.

math and critical thinking are significantly higher than the national 2-year averages. There are no averages for mid-studies comparisons. Completing sophomores are significantly higher than the national 2-year averages in mathematics and at level in all the other comparisons.

- **Table 14 COD and national norms**

		N	Mean	Std. Deviation	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Two-year Public Colleges	Four-year Public Colleges
WRITING SKILLS	Entering Freshmen	50	59.78*-	5.00	58.36	61.20	61.1	63.2
	Mid-studies	100	61.41	5.43	60.33	62.49		
	Completing Sophomores	56	63.07	5.39	61.63	64.51	62.6	64.4
	Total	206	61.47	5.42	60.72	62.21		
MATHEMATICS	Entering Freshmen	52	56.87*	3.51	55.89	57.84	55.9	58.7
	Mid-studies	103	57.23	3.96	56.46	58.01		
	Completing Sophomores	51	59.02**	5.07	57.59	60.44	56.2	58.1
	Total	206	57.58	4.22	57.00	58.16		
READING	Entering Freshmen	47	59.77	5.16	58.25	61.28	59.1	62.4
	Mid-studies	104	59.94	5.33	58.91	60.98		
	Completing Sophomores	56	61.09	5.26	59.68	62.50	61.0	63.0
	Total	207	60.21	5.28	59.49	60.94		
CRITICAL THINKING	Entering Freshmen	52	60.17*	4.54	58.91	61.44	59.1	61.8
	Mid-studies	93	61.13	5.77	59.94	62.32		
	Completing Sophomores	49	61.47	5.85	59.79	63.15	61.1	62.1
	Total	194	60.96	5.48	60.18	61.74		
SCIENCE REASONING	Entering Freshmen	43	57.05	3.96	55.83	58.27	57.1	61.1
	Mid-studies	97	58.15	4.56	57.24	59.07		
	Completing Sophomores	52	60.13	4.69	58.83	61.44	58.9	61.0
	Total	192	58.44	4.59	57.79	59.10		
ESSAY	Entering Freshmen	52	3.327	.6234	3.153	3.5005	3.2	3.0
	Mid-studies	122	3.207	.6686	3.087	3.3268		
	Completing Sophomores	42	3.316	.6876	3.101	3.5297	3.2	3.3
	Total	216	3.257	.6612	3.168	3.3456		

* Sig. at .10 *- Sig. at .10 with COD substantially lower ** Sig. at .000

Freshmen, mid-studies, completing sophomores

A second approach to considering the acquisition of general education skills focuses on changes from freshmen skills to completing sophomore skills. This approach to analysis utilizes classification of cases based on quarter-hour credits at the time of testing. These classifications were previously defined (see page 19). Table 15 lists each of the six-subject area average test scores for the three classifications of students. Comparisons of the averages for the three educational levels indicate that each of the six-subject area averages tended to increase. However, it needs to be noted that only three of the increases from freshman to sophomore averages are statistically significant – Writing Skills, Math, and Science Reasoning. The three subject areas in which the changes from freshmen to completing sophomore are not statistically significant have been grayed – Reading, Critical Thinking, and Essay writing.

These results, which utilize both years' cohorts, were similar to last year's conclusions for five of the six subject areas. Significant increases between freshmen's and sophomores' averages were found for mathematics and science reasoning. The combined two-year data provided support for concluding that writing skills also increase significantly. In the area of essay writing, college reading, and critical thinking, the observed changes are not a statistically significant increase.

- **Table 15 Summary of CAAP**

		N	Mean	Std. Dev.	Std. Error	95% C.I. Lower Bound	95% C.I. Upper Bound	Min.	Max.
WRITING SKILLS	Entering Freshmen	50	59.78	5.00	.71	58.36	61.20	49	70
	Mid-studies	100	61.41	5.43	.54	60.33	62.49	47	71
	Completing Sophomores	56	63.07	5.39	.72	61.63	64.51	51	71
	Total	206	61.47	5.42	.38	60.72	62.21	47	71
MATHEMATICS	Entering Freshmen	52	56.87	3.51	.49	55.89	57.84	51	65
	Mid-studies	103	57.23	3.96	.39	56.46	58.01	49	68
	Completing Sophomores	51	59.02	5.07	.71	57.59	60.44	48	70
	Total	206	57.58	4.22	.29	57.00	58.16	48	70
SCIENCE REASONING	Entering Freshmen	43	57.05	3.96	.60	55.83	58.27	51	67
	Mid-studies	97	58.15	4.56	.46	57.24	59.07	50	72
	Completing Sophomores	52	60.13	4.69	.65	58.83	61.44	53	71
	Total	192	58.44	4.59	.33	57.79	59.10	50	72
READING	Entering Freshmen	47	59.77	5.16	.75	58.25	61.28	49	72
	Mid-studies	104	59.94	5.33	.52	58.91	60.98	47	72
	Completing Sophomores	56	61.09	5.26	.70	59.68	62.50	48	73
	Total	207	60.21	5.28	.37	59.49	60.94	47	73
CRITICAL THINKING	Entering Freshmen	52	60.17	4.54	.63	58.91	61.44	53	70
	Mid-studies	93	61.13	5.77	.60	59.94	62.32	49	73
	Completing Sophomores	49	61.47	5.85	.84	59.79	63.15	50	72
	Total	194	60.96	5.48	.39	60.18	61.74	49	73
ESSAY	Entering Freshmen	52	3.327	.6234	8.644E-02	3.153	3.5005	1.75	4.75
	Mid-studies	122	3.207	.6686	6.053E-02	3.087	3.3268	.00	5.00
	Completing Sophomores	42	3.316	.6876	.1061	3.101	3.5297	2.00	5.50
	Total	216	3.257	.6612	4.499E-02	3.168	3.3456	.00	5.50

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Table 16 repeats the averages and lists the results of an ANOVA analysis for each of the subject area tests. The significance of the differences between the three educational levels is testing using Sheffè's test.

The results of these analyses indicate that significant change in writing skills occur between freshmen entering and sophomore completing their studies. In mathematics the increase between freshmen and sophomores is significant, and the increase between mid-studies and completing sophomore is also significant. Changes in scientific reasoning between entering freshmen and completing sophomores as well as between mid-studies and completing sophomores are significant.

- **Table 16 Comparison of effects**

		N	Mean	F-ratio	Sig. of F	Sig. dif. Soph.
WRITING SKILLS	Entering Freshmen	50	59.78	5.067	.007	.007
	Mid-studies	100	61.41			
	Completing Sophomores	56	63.07			
MATHEMATICS	Entering Freshmen	52	56.87	4.184	.017	.033
	Mid-studies	103	57.23			045
	Completing Sophomores	51	59.02			
SCIENCE	Entering Freshmen	43	57.05	6.014	.003	.004
REASONING	Mid-studies	97	58.15			038
	Completing Sophomores	52	60.13			
READING	Entering Freshmen	47	59.77	1.079	.342	
	Mid-studies	104	59.94			
	Completing Sophomores	56	61.09			
CRITICAL	Entering Freshmen	52	60.17	0.790	.456	
THINKING	Mid-studies	93	61.13			
	Completing Sophomores	49	61.47			
ESSAY	Entering Freshmen	52	3.327	0.803	.449	
	Mid-studies	122	3.207			
	Completing Sophomores	42	3.316			

These patterns of change support the generalization that general education skills development is a process that spans a number of courses and years and is not the result of a limited number of specifically designated courses.

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Chapter

4 Modeling the acquisition of general education skills

The previous sections of this analysis focused on levels of general education skills development attained by specific classifications of College of DuPage students. This section will examine the relationship between measured student characteristics, actions, and courses with general education skills development. This analysis is organized in two ways. First, each of the six subject area models will be presented. Three of these models merit more discussion because of what they imply about the process of general education development. Second, patterns of common influences and non-significant effects in general education skill acquisition will be identiifed starting on page 34.

Modeling Method

The models developed in this section are based on structural equations predictions. Development begins with a full model of eighteen exogenous variables, nine of which are counts of courses in discipline areas, three of which are pre-test scores, three of which are hours spent on study, work, and employment. The remaining three exogenous variables are gender, English as a second language, and credits earned at other colleges. Three intervening variables are included GPA earned at completion of the quarter when tested, total completed developmental credits and the total number of college credits (equal to or greater than 100) earned by completion of the quarter when tested. Figure 1 presents this model. Needless to say, this is a very large and complex model.

The full models for each of the six general education skills were first calculated[7] using all available cases. While each case included values for most of the variables, some cases were missing values for some variables. In this initial modeling, parameters were based on all available cases, not just those with complete data. This estimation made the fullest use of all of the cases collected. Each full model was then calculated a second time, using only the cases with complete data. These two models were compared for substantial differences. Since the models using the maximum cases were similar to the models using only cases with complete data, the smaller set of complete data was used when reducing the full model. Eliminating variables with non-significant paths to the dependent variable then reduced these models. In some cases, one non-significant path was retained in order to test a "common sense" connection of specific interest. Finally, parameters on some of the exogenous variables were relaxed so that the models fit the data.

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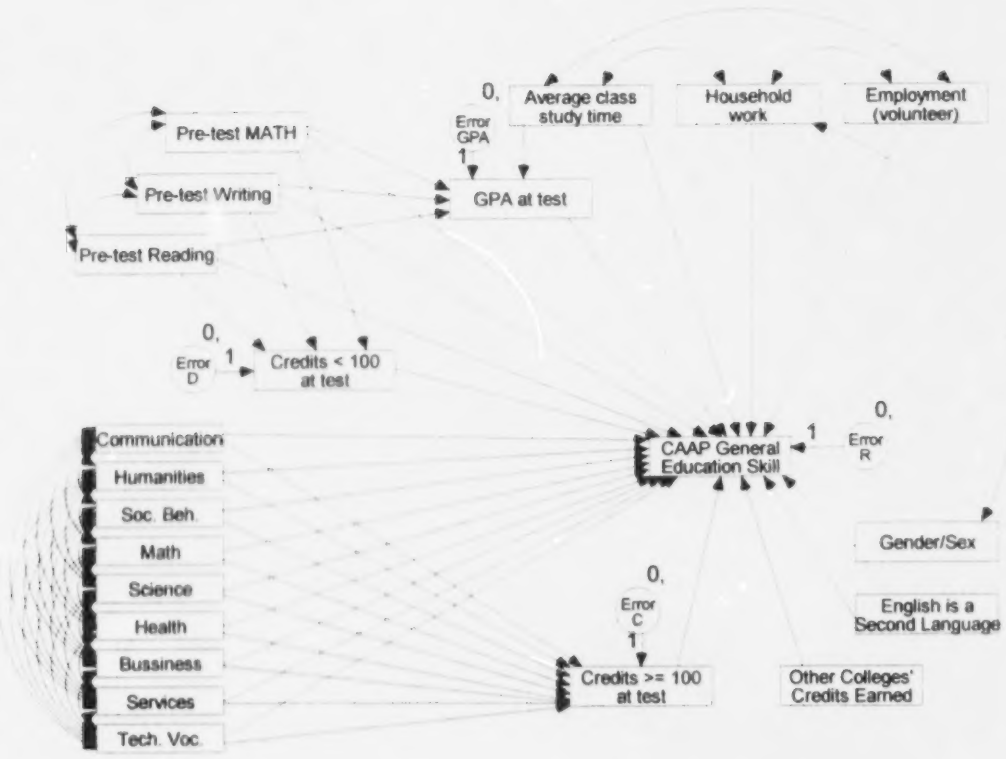
[7] Models were calculated using *Amos 4.0* software by James L. Arbuckle and Werner Wothke. 1995-1999 available from SPSS Inc. Chicago, IL.



- **Figure 1 Full Model**

Acquiring Mathematics skills

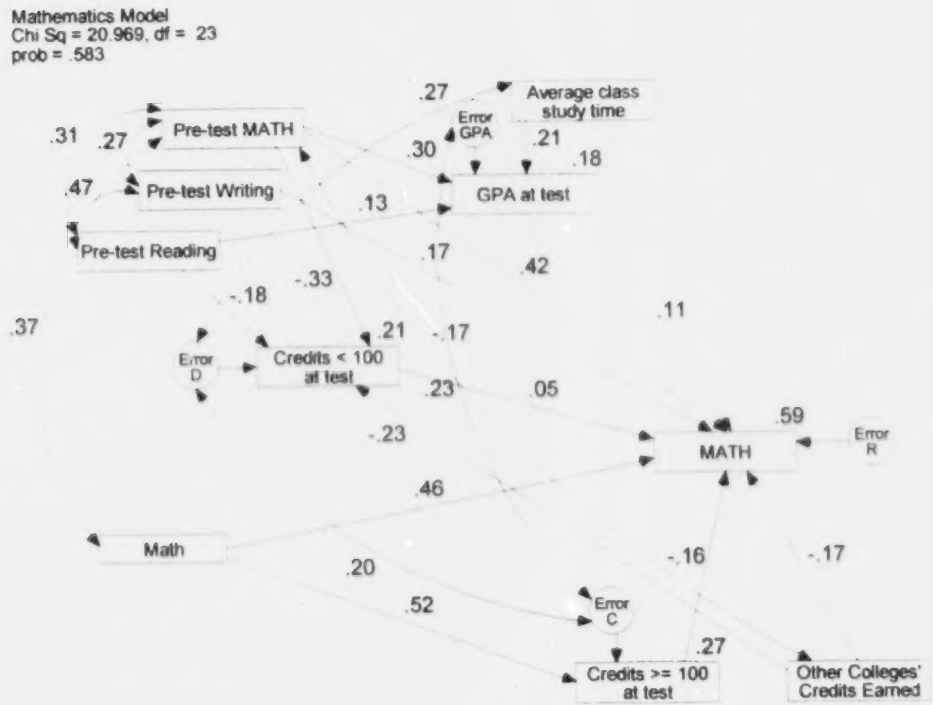
The process of modeling is clearly illustrated by the model examining math skills. Figure 2 illustrates the reduced Mathematics Model. Straight, single headed arrows indicate paths connecting variables. The path weight is a standardized regression coefficient, which may be interpreted as the standardized effect of the originating variable on the target variable **controlling for the other variables** in the model as indicated by arrows.

Thus in the mathematics model, the coefficient between the number of math courses completed and the Math skills test score is .46. This coefficient is judged to be moderately strong. This coefficient can be interpreted as indicating that controlling for math pre-test scores the **more courses in mathematics the higher the level of math skills** as measured by the CAAP test. "Well, of course," one might say. But, as discussed later, this pattern of direct impact from specific course counts is not found in many of the other skills areas.

The curved arrows with heads at either end indicate covariance between variables, which are accepted in calculating the model. Accepting this covariance between exogenous variables is appropriate to estimating the model. The covariance between endogenous variables can be indicative of unspecified relationships or problems with models or it may be a necessity for estimating the model. The accepted covariance paths are presented in

the model for the purpose of full reporting; however, they are judged as acceptable necessities not interesting influences and will not be discussed further.

The model fits the data,[8] and the variables in the model (GPA, developmental credits, math credits, total credits and other college credits) account for 59% of the variance in the math scores. The path between the math pre-test and developmental courses (-.33) indicates a strong connection between pre-test performance and development course enrollment.



- **Figure 2 Mathematics Model**

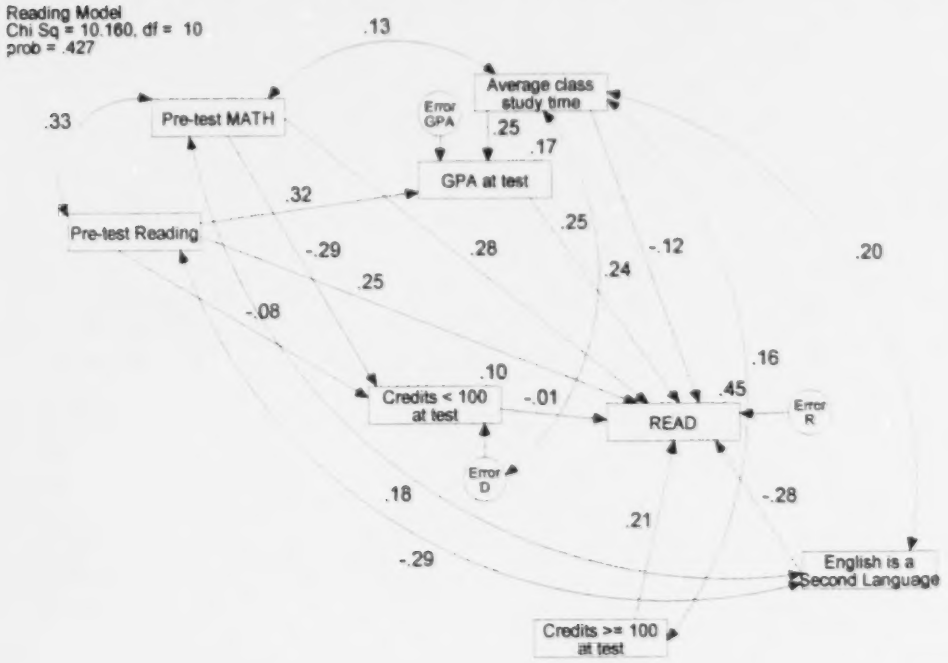
[8] In these models the Chi-Square statistic is a test of the null hypothesis – that the parameters in the proposed model fit the parameters of the sample of data. The probability is the proportion of all possible samples drawn from a population with specified parameters that would have a X^2 (goodness-of-fit) greater than the observed X^2. Therefore, a probability greater than .05 or .10 are judged to adequately fit the data, with the .10 being a higher criterion. Because Chi Square is a test of sampling distributions, not of the observed data, no interpretation should be inferred beyond determining the fit of the model to the observations.

Acquiring College Reading skills

In contrast to the model for mathematics, college reading skills are acquired primarily though the accumulation of courses. The model fits the data reasonably well and .45 of the variance in reading scores is explained by the variables in the model. Figure 3 illustrates the process of reading skills development paths and variables. The path coefficient between the number of college-courses (=> 100) and the CAAP reading score is .21. This is a significant although weak relationship. It may be interpreted as supporting the conclusion that college reading is developed in courses across the curriculum. The path between English as a Second Language and Reading is -.28. This indicates that students with an ESL background tend towards lower reading skills.

The paths between study time, GPA and reading are worth examination. The .25-path coefficient from study time to GPA indicates that spending more time studying "pays off" with higher grades. The path from GPA to reading indicates that students with higher grades tend to have higher reading scores. The direction of this path may, however, be challenged since it may also be that having high reading skills leads to higher GPA. This part of the model requires further examination.

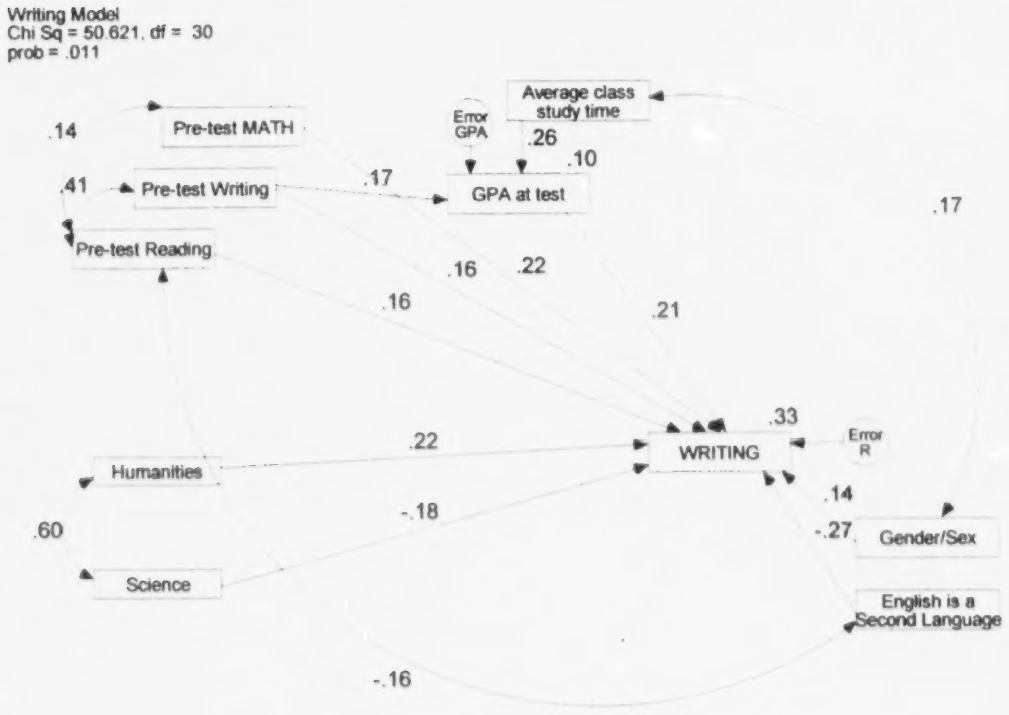
The significance of the -.12-path coefficient from average study time to reading is interesting. Controlling for GPA, students spend less time studying when they have higher reading skills. This, of course, makes intuitive sense. However, it also implies that students who take time to work on improving college reading skills will be rewarded by either (or both) higher grades and/or improved studying efficiency.



- **Figure 3 Reading Model**

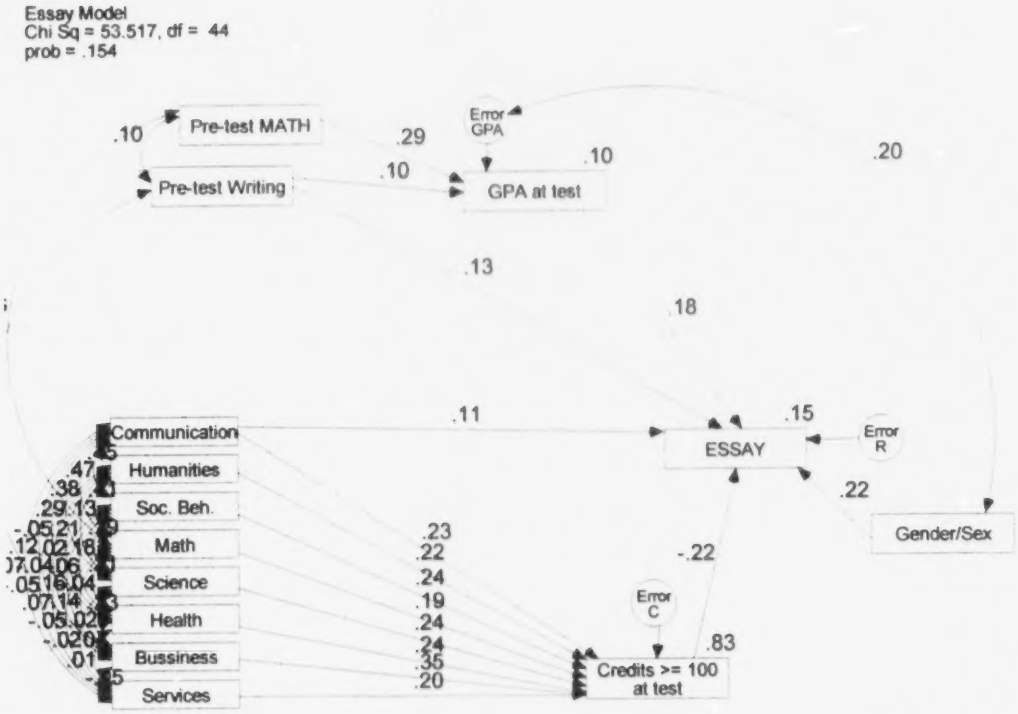
Acquiring Writing and Essay skills

Examination of writing and essay skills draws on two of the CAAP test subject-areas. The CAAP writing skills test is a multiple-choice format test. The CAAP Essay skills test is a writing sample. Figure 4 illustrates the modeling of acquisition of writing skills. It is important to note this model does not fit the data as indicated by the low probability for the Chi Square (X^2 = .011). Since Writing Skills is one of the area-tests that has a significant increase between freshmen and sophomore levels, which appears to happen in the freshmen to mid-studies period, it is troublesome to note the weakness in the model. The observation that courses in the communication area do not significantly impact writing skills is a further challenge to understanding the process.



- **Figure 4 Writing Model**

The modeling of the acquisition of essay writing skills is also not adequate. While the model fits the data, the model explains only 15% of the variance in the CAAP essay area-test scores. The .11-path coefficient between communication classes and essay scores is not significant. Further, the -.22-path between college credits and essay skills could be taken to mean that skills learning in the freshmen to mid-studies period are "lost" as students continue in subsequent studies.



- **Figure 5 Essay Model**

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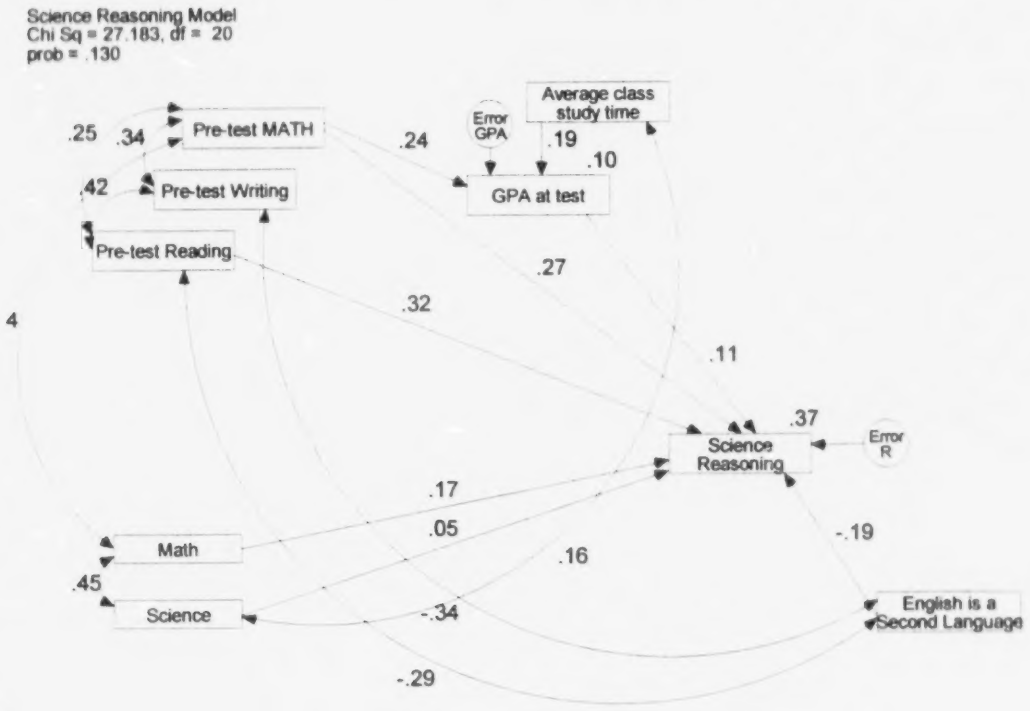
Acquiring Science Reasoning skills

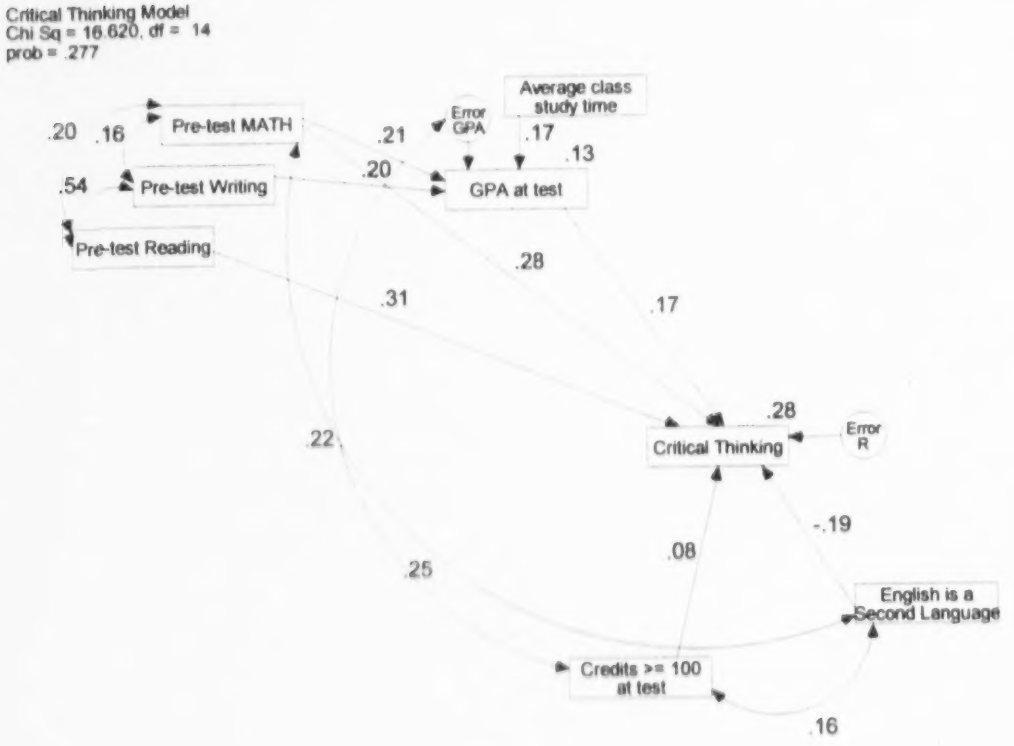
The modeling of science reasoning skills is illustrated in Figure 6. The model fits the data. Thirty-seven percent of the variance in Science Reasoning scores is explained by the other variables in the model. The .32-path coefficient between the pre-test of reading and science reasoning indicates the important of reading skills in reasoning skills. The .17-path coefficient between math courses and science reasoning along with the .24-path coefficient between pre-test in math also support the higher level dependent relationship of science reasoning with the foundations of general education skills. The definition of the CAAP Science Reasoning skills test as a skill and not a content test is implied by the non-significant .05-path between science courses and science reasoning. Based on the significance of the pre-test scores and the lack of significance for both impact from the number of college courses and number of science courses, one might intuit that most of the variance in science reasoning is based in skills and attitudes learned prior to COD college experiences. This conclusion might be worth further examination and discussion with reference to its acceptance or its being a target for change.



- **Figure 6 Science Reasoning Model**

Acquiring Critical Thinking skills

The modeling of acquisition of Critical Thinking skills is illustrated in Figure 7. The mode fits the data, although only 28% of the variance in Critical Thinking scores is explained by the variables in the model. Once again as with Science Reasoning, the .31-path coefficient between the pre-test in reading and the CAAP critical thinking skill illustrates the dependency of critical thinking on reading. Whether this connection is one of dependence at the skills level or one of test construction can be argued. What is of concern is the non-significant path between college course credits (=>100) and critical thinking.



- **Figure 7 Critical Thinking Model**

Time commitments and outcomes

One of the issues frequently discussed with reference to community college students' educational achievement is the issue of competing time commitments and role-strains resulting form high levels of employment and family relationships that differ from traditional students. To examine these issues we included three questions focused on the time commitments to 1) studying for classes, 2) work, and 3) family commitments. These three variables were consistently collected for students taking five of the six area tests. Respondents taking the Essay test did not as consistently answer the institutional

designated questions, and so the time commitment variables were not examined in the modeling of that skill area.

In five skills-area models, no significant effect was found between either time spent in employment or time spent in family commitments and the skill area (controlling for the effects of study time).

In each of the five skills-area models, study time had a direct significant effect on grades. The paths varied from .17 for critical thinking to .26 for writing skills. Thus, it's possible to conclude that students who study more get higher grades or those who get higher grades tend to study more.

In the three models reading, writing and critical thinking students with higher GPA's tended to have significantly higher skills levels. In the models for math and science reasoning, higher GPA's were not significantly related with higher skills levels.

Gender and General Education skill acquisition

Although gender was included as a variable in each of the six full models, the effect of gender was identified as significant **ONLY** in the writing and essay models. As predictable from general observations, females tended to have higher writing and essay scores controlling for the other variables in the models. The observation that it was not a significant impact in mathematics is a positive change from past observations.

Impact of course success based in reading and math skills

The central place reading has in course success is clear when examining the paths from the pre-test in reading to the general education skills [reading pre-test to science reasoning (.32), critical thinking (.31) and reading (.25)]. A parallel comparison form the math pre-test to math skills is .42.

That pre-tests also predict student success is apparent from the paths between the pre-tests and GPA, many of which run in the high twenties and thirties.

Thus, two conclusions may be drawn. First, the core skills of reading and math have substantial impact on students' outcomes. Second, it is evident that our pre-testing program is valid in identifying skills that are significant in student course performance.

If, as this would appear to indicate, the pre-tests are a reasonable predictor of outcomes, what is the impact of knowing this on student behavior? In the case of math, the link of low pre-test skills with enrollment in developmental courses is –33. This is a moderate link in which low pre-test scores tend to increase the number of developmental courses taken. Contrast this with the link of low reading pre-test skills with enrollment in developmental courses of -.08. Here the impact of a longer sequence of developmental courses in mathematics and more rigorous enforcement of mandatory placement is evident.

This would then move us to consider the second part of the link. Are developmental courses effective? In both the math and reading models the pattern is similar. The path from pre-test to the skill is significant (reading = .25 and math = .42). The path from development courses to the skill is not significant (reading = -.01 and math = .05). This pattern indicates that the development courses do not ameliorate the original deficit.

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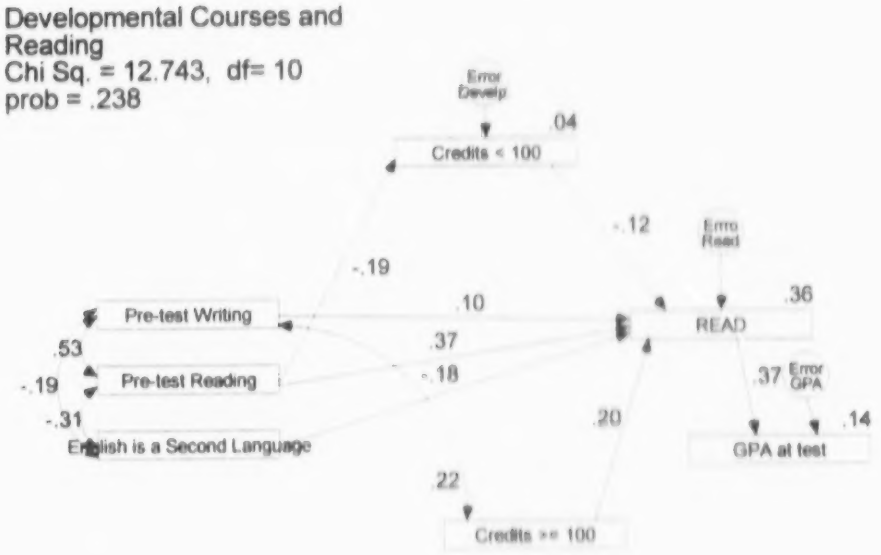
However, this is not to conclude that developmental courses do not have an effect. The measurement of some partial effect is not possible in the current model. But only to say that whatever effect they have, it is not enough to totally overcome the original deficit.

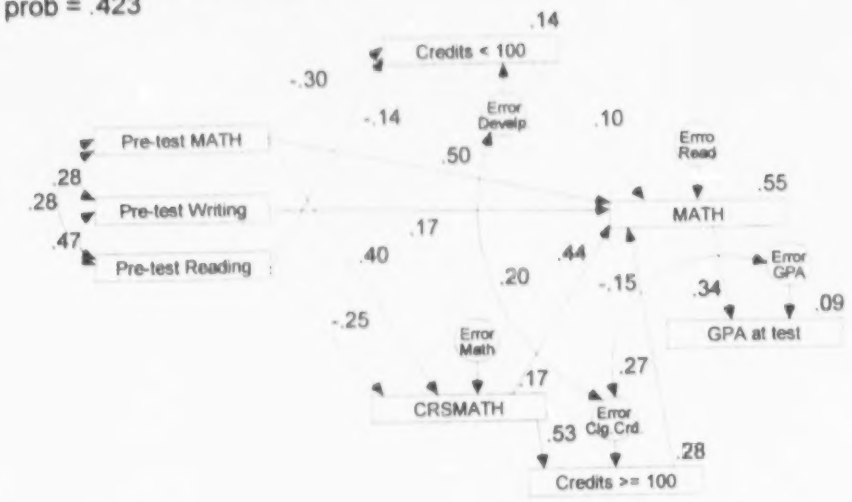
In an effort to further explore these issues two additional models were developed. These models were focused on trying to clarify the impact of developmental course work on the general education skill. Since this analysis is based at the institutional level it should not be confused with an assessment of changes in courses.

Figure 8 illustrates the Reading model and Figure 9 the math model. As previously observed, the math low math pre-test scores more directly impacts enrollment in developmental courses (-.30) than does reading pre-test scores (-.19).

The impact of developmental courses on the CAAP skills is also different for these two areas. In the case of reading, a -.12-path coefficient from developmental courses to reading skills contrasts with a .10-path coefficient from developmental courses to math skills. In both cases these paths approach significant levels (reading 1.7, math 1.6), but fail to attain a ratio of two times their standard error.



- **Figure 8 Developmental Courses and Reading**



- **Figure 9 Developmental courses and math**

Based on these observations, one may conclude that the structural patterns of mandatory placement in the mathematics curriculum forces enrollment in developmental courses. That enrollment then provides marginal improvement in math general education skill when compared with students not participating in developmental courses.

In contrast, the less coercive patterns of advisory placement in reading curriculum result in fewer students taking developmental courses. Further, that controlling for the number of developmental courses completed students do not demonstrate an improvement in college reading skills when compared with students not participating in development courses.

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Chapter

5 Conclusions

A focus for assessment of general education skills development at College of DuPage begins with the definition of general education. Based on our catalogue statement seven outcomes emerge. While it is our intent to gather evidence focusing on each of these outcomes, no single approach provides a complete examination. The first three outcomes have, thus far, been assessed only through self-reports from students. Given that these are self-reported, the rankings may be considered as reflective evaluations rather than direct behavioral reports. The next three outcomes are more easily examined using objective measures since they are skills based. Using the patterns of evidence gathered through two years of general education skills testing using the ACT-CAAP standardized tests, some general conclusions can be drawn. The following items summarize conclusions based on these two-year's cycles of outcomes assessment.

The aims of general education are to enable students to:

1. **Understand and appreciate their culture**

   Among completing sophomores, 35.4% report their College of DuPage courses have meaningful or significant impact on their **cultural appreciation**. This contrasts with 21% to 22% among entering freshmen and mid-studies students. Although only about one-third of the students report significant impact, the change indicates a significant increase in students' evaluation through on-going attendance.

2. **Understand and appreciate their environment**

   Among completing sophomores, 36.5% report their courses have meaningful or significant impact on their **environmental appreciation**. This ranking is substantially higher than the 16.5% ratings among mid-studies students. The 33% ranking among entering freshmen, however, might reflect instability in such self-appraisals.

3. **Develop a system of personal values based on accepted ethics that lead to civic and social responsibility**

   Among completing sophomores, 42.5% report their courses have meaningful or significant impact on their developing a system of personal values based on accepted ethics that lead to civic and social reasonability. This contrasts with similar rankings of 38.6% among entering freshmen and 26.5% among mid-studies students. The U-shaped reports of impacts may reflect first flush of exposure to college-level thinking, followed by mid-studies uncertainty and development of more complex ethical positions.

In each of these three assessments the restrictive nature of self-reports needs to be considered. These data may provide a beginning baseline for consideration and discussion.

The general education goals 4 through 6 are skills areas where direct measurements of student proficiency were obtained from the ACT-CAAP testing over the past two years.

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4. Attain skills in analysis

Assessment of skills development in analysis may be inferred from two of the subject area tests in the CAAP battery: critical thinking and scientific reasoning. Results from the **Critical Thinking** test indicate that entering COD freshmen are significantly higher than the national average for freshmen at two-year public colleges as reported by ACT[9] (60.2 : 59.1). In contrast completing sophomores exit at the sophomore two-year public college national average (61.5 : 61.1). The change from entering freshman to completing sophomore is not statistically significant.

Results from the **Scientific Reasoning** test indicate that Freshmen enter at the national average and sophomores exit at the national average. While the comparison to national averages indicate "at level" performance, the change between freshmen and sophomores is significant as is the change between mid-studies and completing sophomores.

Thus, in the area of developing general education skills in analysis as indicated by these two tests, the students attending COD are in-step with other two-year public students.

5. Attain skills in communications

The broad goal of developing skills in communication is frequently divided into four more specific skills that are frequently described by two dimensions. One of these dimensions is the format dimension of written and oral; the second dimension is the modality of receiving or producing. The four skills are reading, writing, listening, and speaking. The CAAP skill-area tests cover two of these. In the area of writing skills, CAAP has both a multiple-choice instrument and a writing sample essay instrument. In the area of reading, CAAP examines college level skills[10] in both the humanities and social sciences. The current general education skill development assessments do not include measures focused on listening nor on speaking skills.

Results from the **College Reading** tests indicate that Freshmen enter at the national average and exits at national average. The change from freshman to sophomore is not statistically significant. Both the entering Freshmen and completing Sophomore average COD scores are below the comparable norms; however, these deficits are not statistically significant in this two-year comparison.

Results from the **Writing Skills** tests indicate that entering freshmen are significantly below the national average and that completing sophomores are at the national average. Change from freshmen to sophomore level is significant. Based on this test, a multiple-choice instrument, it is reasonable to conclude that students improve their understanding of conventions of standard written English. Results from the **Essay** test, a writing sample format, indicate that entering freshmen and completing sophomores are both at the national average. It should be noted that the national averages for both the freshmen and sophomores at two-year colleges are the same 3.2. The change in COD's average scores between freshmen and sophomores is not statistically significant.

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[9] The averages reported in these comparisons are those for freshmen and sophomores at two-year public colleges. In this report they are referred to as a "national average." The averages used were those published in the *Fall, 1999 CAAP User Norms*.

[10] "The CAAP reading test measures reading comprehension as product of skill in referring, reasoning, and generalizing." These are skills generally developed in content courses by students as part of post-high school studies.

6. Attain skills in quantification – mathematics

General education skills development in quantification is most directly linked to outcomes measured by the **Mathematics** CAAP test. Results indicate that entering freshmen are significantly higher than national norms. Completing sophomores are also significantly higher than the national average. Significant change is observed between both the entering freshman to completing sophomore and the mid-studies to sophomore categories.

7. Attain skills in synthesis

Assessment of the seventh general education outcome requires gestalt approaches that have not yet been designed nor implemented. Some indication of student, employer, and community satisfaction in this area is possible from other assessments including student satisfaction surveys and community needs studies.

Summary of conclusions

- The strongest pattern of development of general education skills by College of DuPage students is acquisition of mathematics – quantification skills.
- Also evident is a pattern of improvement in writing skills as measured through multiple-choice items covering understanding of conventions of standard written English.
- No significant change occurs in development of essay writing skills as measured in a writing sample (which is similar to the pattern in the national norms).
- Although our students demonstrate significant increases in their science reasoning, the completing sophomore average is not significantly higher than national norms.
- Although our students perform at national two-year norms, no significant change occurs in college reading skills. Improving college-level reading skills is probably the single most important outcome. It's worthy of support because college-level reading skills are direct prerequisites to critical thinking and reasoning.
- While freshmen enter with significantly higher critical thinking skills than the national average, they exit at the national average. There is no significant improvement in their critical thinking skills. This general education skill is one that can be developed in a wide variety of content and skills based courses.

The bottom line conclusion justified by these observations is that College of DuPage students are similar to other 2-year public community college students. Although average, their general education skills could be increased by recognizing and implementing some classroom changes in pedagogy. Such development should that focus on ways in which faculty can support skills development across the curriculum while providing subject-area learning. Improving general education skills development is a key to increasing student understanding and knowledge of content area and for the mid-range of our student body that development is best accomplished within the context of their subject-area courses.

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